CLAIMS

What is claimed is:

1. A substantially purified α1,2-fucosyltransferase.

2. The substantially purified α1,2-fucosyltransferase of claim 1, wherein the polypeptide catalyzes the synthesis of Lewis Y.

3. The polypeptide of claim 1, wherein the polypeptide lacks α1,4-fucosyltransferase activity.

4. The polypeptide of claim 1, wherein the polypeptide lacks α1,3-fucosyltransferase activity.

5. The polypeptide of claim 1, wherein the polypeptide lacks α1,4-fucosyltransferase and α1,3- fucosyltransferase activity.

6. The polypeptide of claim 1, wherein the polypeptide has an amino acid sequence comprising SEQ ID NO: 2.

7. An isolated polynucleotide encoding the polypeptide of claim 1.

8. The polynucleotide of claim 7, wherein the sequence encodes the amino acid sequence having SEQ ID NO: 2.

9. The polynucleotide of claim 8, comprising a sequence having at least one repeat of the sequence X XXY YYZ, wherein X = A or C, Y = A or T and Z = A or G.

10. A polynucleotide selected from the group consisting of:

a) SEQ ID NO:1;

b) SEQ ID NO: 1, wherein T is U;

c) nucleic acid sequences complementary to a) or b); and

d) fragments of a), b), or c) that are at least 15 nucleotide bases in length and that hybridize to DNA which encodes the polypeptide set forth in SEQ ID NO: 2.

11. A vector containing the polynucleotide of claim 7.

12. A host cell containing the vector of claim 11.

13. An antibody which selectively binds to the polypeptide of claim 1.

14. The antibody of claim 13, wherein the antibody is monoclonal.

15. The antibody of claim 13, wherein the antibody is polyclonal.

16. A method for detecting α1,2-fucosyltransferase polypeptide in a sample, comprising:

a) contacting the sample with the antibody of claim 13; and

b) detecting binding of the antibody to α1,2-fucosyltransferase polypeptide, wherein binding is indicative of the presence of α1,2-fucosyltransferase polypeptide in the sample.

17. The method of claim 16, wherein the sample is tissue.

18. The method of claim 16, wherein the sample is a biological fluid.

19. The method of claim 16, wherein the presence of α1,2-fucosyltransferase polypeptide in the sample is indicative of infection by *Helicobacter pylori*.

20. The method of claim 16, wherein the presence of α1,2-fucosyltransferase polypeptide in the sample is indicative of the presence of malignant cells.

21. A method for detecting α1,2-fucosyltransferase polynucleotide in a sample, comprising:

a) contacting a sample suspected of containing α1,2-fucosyltransferase polynucleotide with a nucleic acid probe that hybridizes to α1,2-fucosyltransferase polynucleotide; and

b) detecting hybridization of the probe with α1,2-fucosyltransferase polynucleotide, wherein the detection of hybridization is indicative of α1,2-fucosyltransferase polynucleotide in the sample.

22. The method of claim 21, wherein the nucleic acid probe is selected from the group consisting of:

a) a nucleic acid sequence set forth in SEQ ID NO: 1;

b) a nucleic acid sequence set forth in SEQ ID NO; 1, wherein T is U;

c) a nucleic acid sequence complementary to a) or b); and

d) fragments of a), b), or c) that are at least 15 nucleotide bases in length and that hybridize under stringent conditions to DNA which encodes the polypeptides set forth SEQ ID NO: 2.

23. A method for detecting α1,2-fucosyltransferase polynucleotide in a sample, comprising amplifying the α1,2-fucosyltransferase polynucleotide.

24. The method of claim 23, wherein the polynucleotide is amplified using PCR.

25. A recombinant method for producing α1,2-fucosyltransferase polypeptide, comprising:

inserting a nucleic acid comprising the polynucleotide of claim 7 adjacent to a selectable marker, such that the resulting polynucleotide encodes a recombinant α1,2-fucosyltransferase polypeptide fused to the selectable marker.

26. A polynucleotide produced by the method of claim 25.

27. A host cell containing the polynucleotide of claim 25.

28. A recombinant method for producing α1,2-fucosyltransferase polypeptide, comprising:

a) culturing a recombinant host cell containing a polynucleotide encoding the α1,2-fucosyltransferase polypeptide under conditions which allow expression of α1,2-fucosyltransferase polypeptide; and

b) isolating the polypeptide.

29. A method of producing a α1,2-fucosyltransferase fusion protein comprising:

a) growing a host cell containing a polynucleotide encoding α1,2-fucosyltransferase polypeptide operably linked to a polynucleotide encoding a polypeptide or peptide of interest under conditions which allow expression of the fusion protein; and

b) isolating the fusion protein.

30. A gene expression system for producing α1,2-fucosyltransferase comprising a host cell modified with a polynucleotide encoding α1,2-fucosyltransferase polypeptide or an enzymatically active portion thereof.

31. The gene expression system of claim 30, wherein the polynucleotide is DNA.

32. The gene expression system of claim 30, wherein the polynucleotide is cDNA.

33. The gene expression system of claim 30, wherein the polynucleotide is RNA.

34. The gene expression system of claim 30, wherein the host cell is selected from the group consisting of a bacterial cell, a yeast cell, a fungal cell, a plant cell or an animal cell.

35. The gene expression system of claim 30, wherein the host cell is recombinantly modified by transfection with a plasmid.

36. The gene expression system of claim 35, wherein the plasmid comprises a selectable marker.

37. The gene expression system of claim 36, wherein the selectable marker is glutamine synthetase.

38. A method for producing α1,2-fucosyltransferase polypeptide, comprising the steps of:

(a) culturing a gene expression system comprising a host cell modified with a polynucleotide encoding the α1,2-fucosyltransferase polypeptide or an enzymatically active portion thereof; and

(b) harvesting the α1,2-fucosyltransferase.

39. The method of claim 38, further comprising substantially purifying the harvested α1,2-fucosyltransferase polypeptide.

40. The method of claim 38, wherein the polynucleotide is DNA.

41. The method of claim 38, wherein the polynucleotide is cDNA.

42. The method of claim 38, wherein the polynucleotide is RNA.

43. The method of claim 38, wherein the host cell is recombinantly modified by transfection with a plasmid.

44. The method of claim 43, wherein the plasmid comprises a selectable marker.

45. The method of claim 44, wherein the selectable marker is glutamine synthetase.

46. The method of claim 38, wherein the host cell is selected from the group consisting of bacterial cell, yeast cell, fungal cell, plant cell or animal cell.

47. A method for producing a fucosylated oligosaccharide, the method comprising contacting a α1,2-fucosyltransferase polypeptide with an α1,2-fucosyltransferase substrate for a suitable time and under suitable conditions to produce the oligosaccharide.

48. The method of claim 47, wherein the fucosylated oligosaccharide is selected from the group consisting of Le^B, Le^y or H type 1 and H type 2.

49. The method of claim 47, wherein the substrate is LacNAc-R and GDP-fucose.

50. The method of claim 47, wherein the oligosaccharide is purified.

51. A method for producing fucosylated oligosaccharides, the method comprising the steps of:

(a) culturing a gene expression system comprising a host cell modified with a polynucleotide encoding a α1,2-fucosyltransferase polypeptide or an enzymatically active portion thereof; and

(b) contacting the host cell with a substrate, under conditions and for sufficient time to produce the oligosaccharides.

52. The method of claim 51, wherein the fucosylated oligosaccharide is selected from the group consisting of Le^B, Le^y or H type 1 and H type 2.

53. The method of claim 51, wherein the substrate is LacNAc-R and GDP-fucose.

54. The method of claim 51, wherein the oligosaccharide is purified.